De Minimis Emissions Determination Methodology for the Arizona HAPRACT Rule

Presented to

Arizona HAP Stakeholders

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Objectives

- Describe statutory context of de minimis emissions thresholds
- Describe air dispersion modeling used to determine de minimis levels
- Explain calculation of de minimis levels and the table of values

Statutory Context

- *De minimis* refers to a level of emissions below which certain regulatory requirements do not apply
- A.R.S. § 49-426.06(B)
  - "For purposes of determining whether a change constitutes a modification, the director shall by rule establish appropriate de minimis amounts for hazardous air pollutants that are not federally listed hazardous air pollutants. In establishing de minimis amounts, the [ADEQ] director shall consider any relevant guidelines or criteria promulgated by the [USEPA] administrator."

Statutory Context

- Federal HAP de minimis not established under 112(g)
  - Proposed rule will cover only Federal HAPS
- Statutes require definition of de minimis levels for HAPRACT applicability to modifications
- De minimis levels will apply to modifications of existing sources
  - Source category must be listed as potentially subject to HAPRACT (SIC code)
  - Applicant can demonstrate HAPRACT not needed to protect health (Risk Management Analysis or RMA)

Air Dispersion Modeling

- USEPA SCREEN3 model
  - Most recent version (96043)
  - Screening version of refined ISC3 model
- Assumed facility with worst-case emission dispersion characteristics
  - Capped stack on single-story building
  - Emissions are at ambient temperature and have no vertical velocity
  - Stack height based on maximum building downwash effects

Air Dispersion Modeling

- Source characteristics
  - Emission rate = 1 gram/second
  - Height = 5.64 meters (18.5 ft)
  - Diameter = 1 meter (3.28 ft)
  - Exit velocity = 0.001 meters/second
  - Exit temperature = 293 deg K (68 deg F)
- Building characteristics
  - Height = 3.66 meters (12 ft)
  - Length = Width = 40 meters (131 ft)

Air Dispersion Modeling

- Automated receptor distances used
  - From stack (0 meters) to 10 km (6.2 miles)
  - Model also automatically locates specific distance to overall peak impact
    - For instance, overall maximum may occur at 43 meters from source
    - Model starts search for peak at closest distance specified (at the stack in this case)

Air Dispersion Modeling

- Other SCREEN3 model options used
  - Regulatory mixing height & cavity options
  - Default anemometer height (10 m) (32 ft)
  - Flat simple terrain
  - Rural dispersion
  - Default ambient temperature (293 K) (68 F)
  - Full meteorology (54 wind speed/stability combinations)

De Minimis Calculations

- Calculated using modeled concentration and previously developed health-based Ambient Air Concentrations (AACs)
  - Short-term values used to define hourly emission levels
  - Long-term values used to define annual emission levels
- Goal is to calculate the emission rate that would produce ambient air concentration equal to the AACs

De Minimis Calculations

- Starting point is maximum 1-hour concentration estimated by SCREEN3
  - Outputs 1-hour concentration in micrograms per cubic meter (μg/m3)
  - Results are for each 1 gram per second (g/s) of emissions
  - Referred to as “concentration-to-emission-rate ratio”
  - Expressed in milligrams per cubic meter per gram per second of emissions, or (mg/m3) / (g/s)

    (1 mg/m^3 = 1,000 $\mu g/m^3$)

De Minimis Calculations

- Equation used:
  - E_d = AAC / CER, where
    - E_d = De minimis emission rate (g/s)
    - AAC = Reference ambient air concentration (mg/m^3)
    - CER = Concentration-to-emission-rate ratio [$(mg/m^3)/(g/s)$]
      - SCREEN3 outputs 1-hour concentration in micrograms per cubic meter (μg/m3); 1 mg/m^3 = 1,000 $\mu g/m^3$
      - For annual period, 1-hour CER is multiplied by 0.08

De Minimis Calculations

- Emission rates converted to English units
  - Short-term: (lb/hr) = (g/s) / 0.126
  - Long-term: (lb/yr) = 8,760 * (g/s) / 0.126
    - 8,760 hours per year
    - 1 g/s = 0.126 lb/hr

De Minimis Calculations

- Example: Styrene, Short-term
  - Acute AAC = 554 mg/m^3
  - 1-hour CER = 140.3 $(mg/m^3)/(g/s)$
  - E_d = 554 / 140.3 = 3.95 (g/s) / 0.126 = <u>31 lb/hr</u>
- Example: Styrene, Annual
  - Chronic AAC = 1.04 mg/m^3
  - Annual CER = 140.3*0.08 = 11.224 $(mg/m^3)/(g/s)$
  - E_d = 1.04 / 11.224 = 0.09266 (g/s)

    0.09266 (g/s) * 8,760 / 0.126 = <u>6,442 lb/yr</u>

De Minimis Levels Table

- Table in report lists thresholds for 73 HAPs
  - Federal HAPs
  - Compounds identified as being emitted by existing sources in Arizona
  - From facilities with at least 1 TPY for a single HAP or 2.5 TPY for all HAPs (thresholds in statutes)
- Single de minimis value shown for certain compounds in table
  - Both annual and hourly values were calculated
  - If annual less than hourly, only annual is shown